IN THE CLAIMS

Please cancel claim 1 and add new claims 2-13 as follows:

--2. A computer-based method for prediction of behavior in a complex system using measured data comprising a plurality of data points and a set of independent variables, the method comprising the steps of:

A1

(a) inputting the plurality of data points and the set of independent variables into a computer;

(b) defining a first subset of independent variables within the set of independent variables comprising a least quantity of independent variables estimated to fit the measured data;

(c) determining a goodness-of-fit to the measured data at a predetermined minimum level for each independent variable of the first subset of independent variables;

(d) eliminating each independent variable within the first subset whose presence or elimination fails to change the goodness-of-fit at the predetermined minimum level;

(e) defining a next subset of independent variables larger than the first subset of independent variables;

(f) adding the next subset of independent variables to a remaining group of the first subset of independent variables to define a combined group of independent variables;

(g) determining the goodness-of-fit to the measured data at the predetermined minimum for the combined group of independent variables;

(h) eliminating each independent variable of the combined group of independent variables whose presence or elimination fails to change the goodness-of-fit at the predetermined minimum level;

(i) repeating steps (e) through (h) until the goodness-of-fit to the measured data meets the predetermined minimum level in a final iteration; and

(j) providing an output comprising the combined group of independent variables remaining after the final iteration, wherein the remaining independent

variables comprise the smallest subset of independent variables that fits the measured data.

3. The computer-based method of claim 2, wherein the plurality of data points comprises daily returns of financial securities, wherein the daily returns have unknown covariances.

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4. The computer-based method of claim 3, wherein the daily returns comprise a linear combination of unknown factors and a part that fluctuates independently corresponding to noise, according to the relationship

$$X_\alpha = \sum_{\beta=1}^{k} \Lambda_{\alpha,\beta} f_\beta + N_\alpha ,$$

A1 Cont.

where α and β are financial securities, $_\alpha$ is the daily return for financial security α, f_β is an unknown factor, $\Lambda_{\alpha,\beta}$ is a loading matrix, and N_α is the noise.

5. The computer-based method of claim 2, wherein the goodness-of-fit is the logarithm of the likelihood function according to the relationship

$$L = -2 \ln \Pr(D|M) = \sum_n w_n \left(\ln\|V_n\| + x_n \circ V_n^{-1} \circ x_n \right),$$

Sub C1

where L is the log-likelihood function, V is the covariance matrix, $\Pr(D|M)$ is a goodness-of-fit quantity measuring the probability of data D given model M, and w_n is an arbitrary weight.

6. The computer-based method of claim 2, wherein the least quantity of independent variables corresponds to zero unknown factors and a covariance matrix consisting of a diagonal.

7. The computer-based method of claim 2, wherein the output comprises a covariance matrix containing a plurality of loading matrix coefficients, wherein the number of off-diagonal, non-zero loading matrix coefficients is minimized.

8. A system for prediction of behavior in a complex system using measured data comprising a plurality of data points and a set of independent variables, the system comprising:

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a computer having an input for receiving the plurality of data points and the set of independent variables;

computer software contained within the computer for performing a plurality of iterations, each iteration comprising identifying a subset of independent variables within the set of independent variables and determining a goodness of fit to the measured data at a predetermined minimum level for each independent variable of the subset, eliminating each independent variable within the subset whose presence or elimination fails to change the goodness-of-fit at the predetermined minimum level, and combining, after the plurality of iterations, remaining independent variables to identify the smallest subset of independent variables that fits the measured data to generate an output;

wherein the plurality of iterations utilizes increasingly larger subsets of independent variables.

9. The system of claim 8, wherein the plurality of data points comprises daily returns of financial securities, wherein the daily returns have unknown covariances.

10. The system of claim 9, wherein the daily returns comprise a linear combination of unknown factors and a part that fluctuates independently corresponding to noise, according to the relationship

$$X_\alpha = \sum_{\beta=1}^{k} \Lambda_{\alpha,\beta} f_\beta + N_\alpha ,$$

where α and β are financial securities, $_\alpha$ is the daily return for financial security α, f_β is an unknown factor, $\Lambda_{\alpha,\beta}$ is a loading matrix, and N_α is the noise.

11. The system of claim 8, wherein the goodness-of-fit is the logarithm of the likelihood function according to the relationship

$$L = -2 \ln \Pr(D|M) = \sum_n w_n \left(\ln \|V_n\| + x_n \circ V_n^{-1} \circ x_n \right),$$

where L is the log-likelihood function, V is the covariance matrix, $\Pr(D|M)$ is a goodness-of-fit quantity measuring the probability of data D given model M and w_n is an arbitrary weight.

12. The system of claim 8, wherein the least quantity of independent variables corresponds to zero unknown factors and a covariance matrix consisting of a diagonal.

cont'd.

13. The system of claim 8, wherein the output comprises a covariance matrix containing a plurality of loading matrix coefficients, wherein the number of off-diagonal, non-zero loading matrix coefficients is minimized.--